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GENERAL ELECTRIC
INSTRUMENTATION
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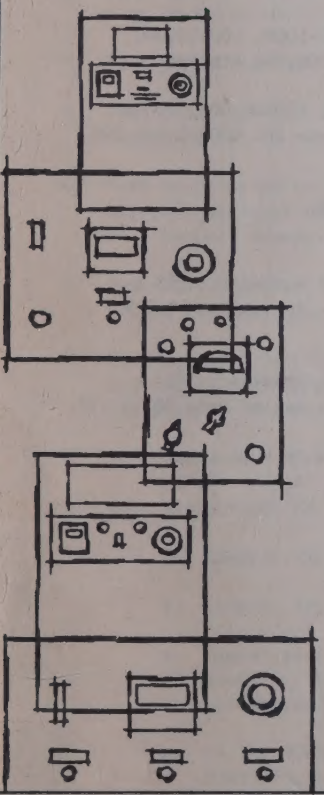
MODEL 2850

Electronic VIBROTEST®

OPERATING INSTRUCTIONS



GENERAL ELECTRIC CO.
Instrumentation & Control
228 W. Florence Ave.
Inglewood, Calif. 90301

ASSOCIATED RESEARCH, Incorporated
3758 WEST BELMONT AVENUE • CHICAGO 18, ILLINOIS

INSTRUMENTS for measuring:

- Insulation Resistance . . the VIBROTEST®
- Ground Resistance . . the VIBROGROUND®
- Earth Resistivity . . the VIBROGROUND®
- High Voltage Breakdown, AC-DC . . the HYPOT®

MODEL 2850 VIBROTEST MEGOHMMETER

SPECIFICATIONS

INPUT:	115 VOLT AC, 60 CPS, 1 PHASE; FIVE FOOT LINE CORD WITH THREE-PRONG GROUNDED PLUG.
RANGES:	AT 50 VDC: .1-10, 1-100, 10-1000, 100-10,000, 1000-100,000, AND 10,000-1,000,000 MEGOHMS. AT 500 VDC: 1-100, 10-1000, 100-10,000, 1000-100,000, 10,000-1,000,000, AND 100,000-10,000,000 MEGOHMS.
SHORT CIRCUIT CURRENT:	10 MA AT 500 V TEST POTENTIAL. 1 MA AT 50 V TEST POTENTIAL.
ACCURACY:	MEGOHM READING AT 500 V TEST POTENTIAL: 2% OF READING OVER MOST OF RANGE - VARIES FROM 1.25% TO 5%. MEGOHM READING AT 50 V TEST POTENTIAL: 5% OF READING OVER MOST OF RANGE - VARIES FROM 3% TO 13%.
TEST VOLTAGE:	500 VOLTS $\pm$ 2 V FROM NO LOAD TO FULL LOAD. 50 VOLTS $\pm$ 5 V FROM NO LOAD TO FULL LOAD.

MODEL 2850 VIBROTEST MEGOHMMETER

OPERATING INSTRUCTIONS

1. Plug line cord into a 115 volt, 60 CPS, 1 phase, three-prong receptacle. (An adapter may be used to connect the line cord to a two-prong receptacle. In that case it is essential that the adapter ground lead be connected to a good ground).

2. Turn the range selector switch to the DISCH. position.

3. Turn ADJ. A control clockwise to turn the instrument on. Allow a warm-up time of approximately 2 minutes.

4. Turn 50/500 volt switch to 500 volt position.

5. Turn ADJ. A control so that meter pointer lines up with ∞ at the counter-clockwise end of scale.

6. Turn selector switch to CHK. B position. This connects an internal standard resistor across the measuring circuit, and the meter pointer will deflect toward the clockwise or "B" end of the scale.

7. Turn ADJ. B control until meter pointer lines up with the 1 megohm point at the clockwise end of the scale.

8. Turn selector switch back to the DISCH. position. In this position the test leads are "cold" and there is no shock hazard if the clips are accidentally touched.

9. Select required test voltage with the 50/500 volt switch.

10. Make connections to the item under test as follows:

    a. Connect the TEST lead to the "hot" side of the item.

    b. Connect the RETURN lead to the "cold" side of the item.

    c. Other isolated metallic circuits in the item may then be connected to the GUARD terminal, if desired, so that stray leakage to those points will not influence the meter reading.

    d. If the RETURN lead is connected to a grounded part of the item, the ground switch must be placed in the RET. (return)

POSITION. IF THE GUARD TERMINAL IS CONNECTED TO A GROUNDED PART OF THE ITEM UNDER TEST, THEN THE GROUND SWITCH MUST BE PLACED IN THE GRD. (GUARD) POSITION.

IMPORTANT: IF THE GROUND SWITCH IS PLACED IN THE WRONG POSITION, IT HAS THE EFFECT OF PLACING A SHORT CIRCUIT ACROSS THE DC SUPPLY AND NO READING CAN BE TAKEN (SEE FIGURE 1).

11. AFTER CONNECTIONS HAVE BEEN MADE TO THE ITEM UNDER TEST AND THE GROUND SWITCH PLACED IN ITS PROPER POSITION, SLOWLY ROTATE THE RANGE SELECTOR SWITCH TO THE POSITION THAT YIELDS THE BEST READABILITY ON THE METER SCALE. IF LOAD IS HIGHLY CAPACITIVE, REMAIN IN THE X1 POSITION SEVERAL SECONDS TO PERMIT RAPID CHARGING.

12. ALLOW SUFFICIENT TIME FOR THE READING TO STABILIZE. THE INSULATION RESISTANCE IN MEGOHMS IS THEN THE METER READING TIMES THE MULTIPLYING FACTOR INDICATED BY THE RANGE SWITCH POSITION (TIMES 0.1 IF THE VOLTAGE SWITCH IS IN THE 50 V POSITION).

13. AFTER THE TEST IS COMPLETED, TURN THE SELECTOR SWITCH BACK TO THE DISCH. POSITION BEFORE DISCONNECTING THE TEST LEADS. WHEN THE SWITCH IS IN THE DISCH. POSITION, THE HIGH VOLTAGE IS REMOVED FROM THE TEST LEADS AND A DISCHARGE RESISTOR IS AUTOMATICALLY CONNECTED ACROSS THE TERMINALS TO DISCHARGE BOTH THE MEGOHMMETER AND THE ITEM UNDER TEST.

GENERAL FEATURES

PRINCIPLES OF OPERATION: The megohmmeter measures the insulation resistance of the item under test by metering the current output of the highly regulated DC supply with a balanced bridge amplifier. The 50/500 volt supply uses long life silicon rectifiers and is regulated against line voltage fluctuation from 100 to 130 volts. A cathode follower electronic regulator holds the output voltage steady under varying load conditions, reduces ripple, and assures maximum reading stability. The high gain balanced bridge amplifier used in the metering circuit is powered from an independent DC supply which also uses silicon rectifiers and is regulated against line voltage fluctuations. Electronic overload circuits protect the constant voltage supply and the 4-1/2 inch wide view indicating meter.

Modular construction through the use of latest printed circuit board techniques and internal adjustments to compensate for tube replacement provide for ease of maintenance and field repair.

RANGE SWITCH: In addition to its primary function of connecting the proper range multiplier, this switch also connects a load discharge resistor and a calibration standard resistor into the appropriate circuits.

When the switch is turned to CHK. B position, an internal standard resistor, representing a test load, is connected across the measuring terminals of the instrument. The meter pointer will then deflect to the "B" or clockwise end of the scale and calibration can be made (see ADJ. B control).

In the DISCH. position a low value power resistor is connected across the measuring terminals so that the capacitance of the load and the megohmmeter will be discharged to prevent shock hazards when handling the test leads.

The X1, X10, etc. positions extend the range of the instrument by the designated amount. For example, if the meter reads 2 megohms and the range switch were in the X10K position, the actual insulation resistance would be 2 x 10K or 20,000 megohms. If the 50/500 volt switch is in the 50 volt position, the reading must also be multiplied by 0.1. In above case at 50 V, the resistance would be 2 x 10K x 0.1 = 2000 megohms.

When connecting or disconnecting a specimen or when the instrument is not in use, the range switch should be turned to the DISCH. position.

ADJUST "A" CONTROL: The ADJUST "A" control balances the electronic megohmmeter amplifier which in turn calibrates the meter pointer at the "A" or counter-clockwise end of the scale. This adjustment should only be made with

THE RANGE SWITCH IN THE DISCHARGE POSITION AND THE 50/500 VOLT SWITCH IN THE 500 VOLTS POSITION. THE EXTREME COUNTER-CLOCKWISE POSITION OF THE ADJUST "A" CONTROL ACTIVATES THE POWER SWITCH TO TURN THE INSTRUMENT OFF.

ADJUST "B" CONTROL: THE ADJUST "B" CONTROL CALIBRATES THE FULL SCALE SENSITIVITY OF THE METER. THIS CONTROL SHOULD ONLY BE ADJUSTED WHEN THE RANGE SWITCH IS IN THE CHECK "B" POSITION AND THE 50/500 VOLTS SWITCH IN THE 500 VOLT POSITION.

VOLTS SWITCH: THIS SWITCH SELECTS EITHER 50 OR 500 VOLTS AS THE MEASURING POTENTIAL. THE INSULATION RESISTANCE READING OBTAINED BY MULTIPLYING THE SCALE READING BY THE RANGE SWITCH SETTING IS CORRECT FOR THE 500 VOLT POSITION OF THIS SWITCH. IF THIS SWITCH IS TURNED TO THE 50 VOLT POSITION, THE READING SHOULD BE DIVIDED BY 10 (x 0.1).

GROUND SWITCH: THE GROUND SWITCH CONNECTS EITHER THE "RETURN" LEAD OR THE "GUARD" TERMINAL TO GROUND (CHASSIS AND EARTH GROUND). THIS PERMITS BYPASSING THE STRAY LEAKAGE CURRENTS AROUND THE METERING CIRCUIT SO THAT THE MEGOHMMETER MEASURES ONLY THE RESISTANCE UNDER TEST. FIGURES 2, 3, AND 4 SHOW TYPICAL GUARD CIRCUIT CONNECTIONS AND PROPER USE OF THE GROUND SWITCH.

ON AND O.L. INDICATORS: THE ON INDICATOR LIGHT SHOWS THAT POWER IS TURNED ON. THE O.L. (OVERLOAD) INDICATOR LIGHT SIGNALS THAT AN OVERLOAD CONDITION EXISTS. THE OVERLOAD INDICATOR WILL LIGHT WHENEVER THE RESISTANCE OF THE ITEM UNDER TEST IS SO LOW THAT EXCESS CURRENT WOULD BE DRAWN (ON THE LOWER RANGES ONLY). ON THE HIGHER RANGES THE O.L. INDICATOR DOES NOT OPERATE SINCE THE POWER SUPPLY IS INHERENTLY PROTECTED AGAINST EXCESS CURRENT BY THE MULTIPLIER RESISTANCES. THE O.L. INDICATOR WILL ALSO LIGHT IF THE GROUND SWITCH IS IMPROPERLY OPERATED.

→ X1 & X10 0→500V. Not 0→50V.

LINE CORD: LINE CORD SHOULD CONNECT THE INSTRUMENT TO A 115 VOLT, 60 CPS, SINGLE PHASE SUPPLY. THE CORD TERMINATES IN A STANDARD THREE-PRONG PLUG, ONE PRONG BEING THE GROUND CONNECTION. IF A THREE-PRONG GROUNDED OUTLET IS NOT AVAILABLE, A TWO-PRONG ADAPTER WITH GROUND CLIP MUST BE USED. IT IS ESSENTIAL FOR PROPER INSTRUMENT OPERATION AND OPERATOR SAFETY THAT THE GROUND CLIP BE CONNECTED TO A GOOD EARTH GROUND OR THE GROUNDED CONDUIT.

TEST LEAD, RETURN LEAD, AND GUARD TERMINAL: THE TEST AND RETURN LEADS ARE FOR CONNECTION ACROSS THE INSULATION RESISTANCE TO BE MEASURED. THE RETURN LEAD IS AT + 500 VOLTS DC WITH RESPECT TO THE TEST LEAD. THE GUARD TERMINAL IS USED FOR THE GUARD CIRCUIT (OR BYPASS) CONNECTION TO THE ITEM UNDER TEST. THIS TERMINAL IS AT APPROXIMATELY THE SAME POTENTIAL AS THE TEST LEAD. TYPICAL CONNECTIONS ARE SHOWN IN FIGURES 2, 3, 4, AND 5.

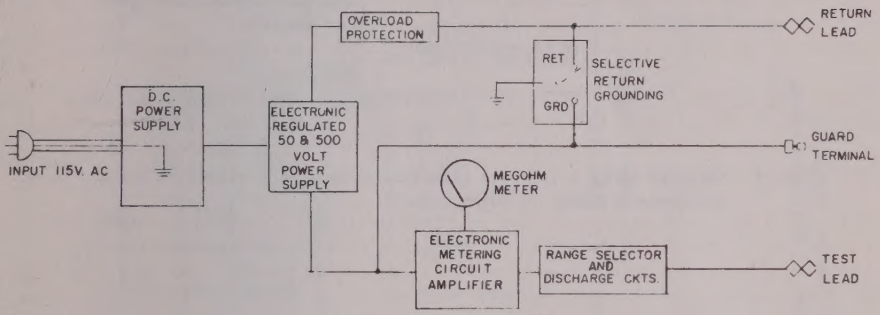


FIG. 1 ELECTRONIC MEGOHMMETER - BLOCK DIAGRAM.

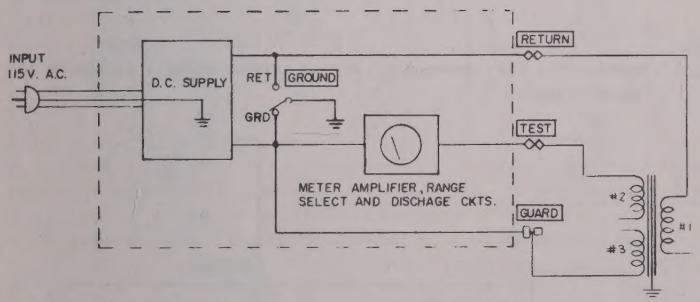


FIG. 2 TRANSFORMER - TEST WINDING #1 TO WINDING #2. LEAKAGE TO CORE AND WINDING #3 BYPASSED TO GUARD CIRCUIT.

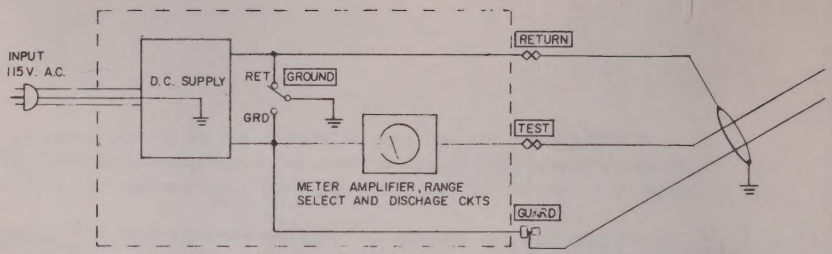


FIG. 3 SHIELDED CABLE - TEST ONE CONDUCTOR TO SHEATH. LEAKAGE TO OTHER CONDUCTOR BYPASSED TO GUARD CIRCUIT.

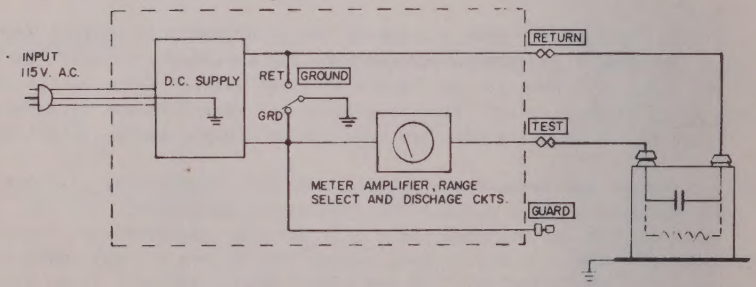


FIG. 4 COMPONENT - TEST COMPONENT. BYPASS LEAKAGE CURRENT TO GROUND TO GUARD CIRCUIT.

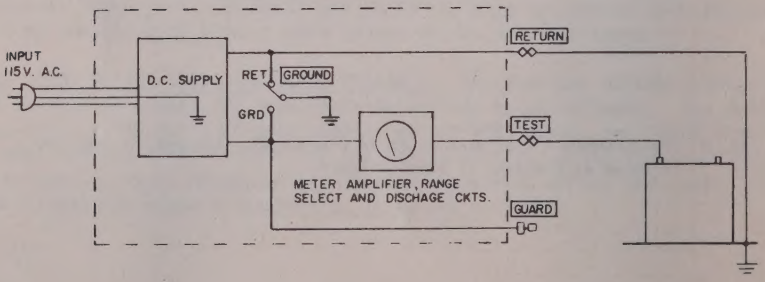
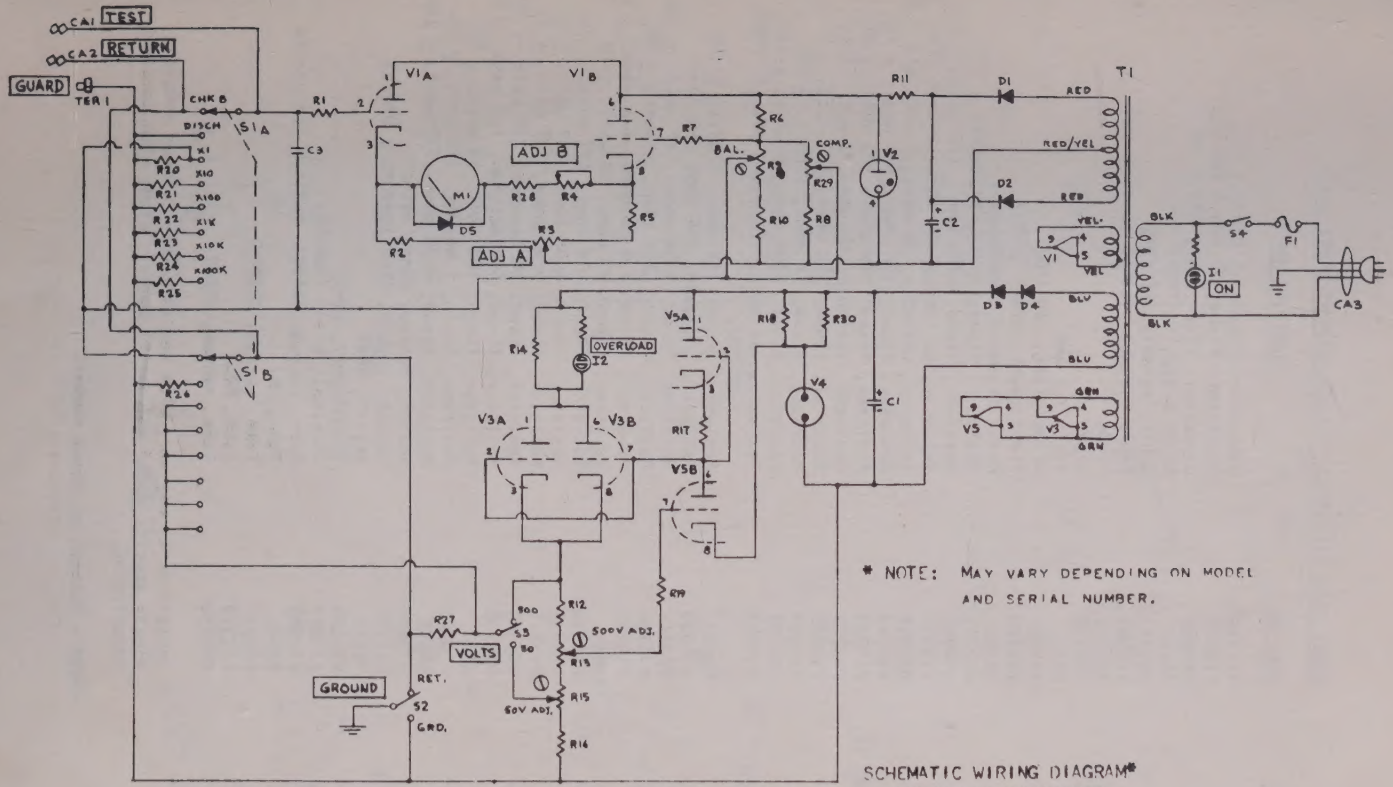


FIG. 5 COMPONENT - GUARD CIRCUIT NOT USED.



* NOTE: MAY VARY DEPENDING ON MODEL AND SERIAL NUMBER.

SCHEMATIC WIRING DIAGRAM*
ELECTRONIC VIBROTEST

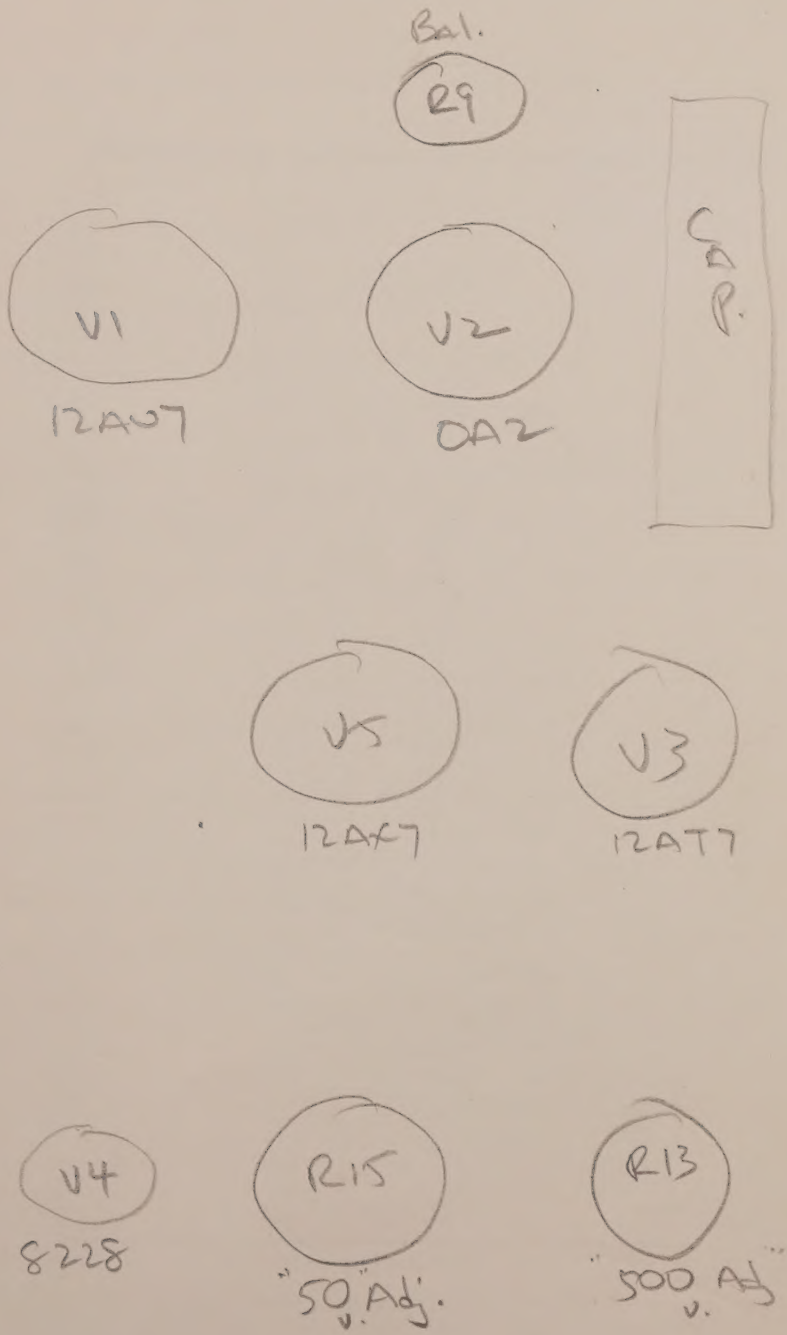
FIG. 6

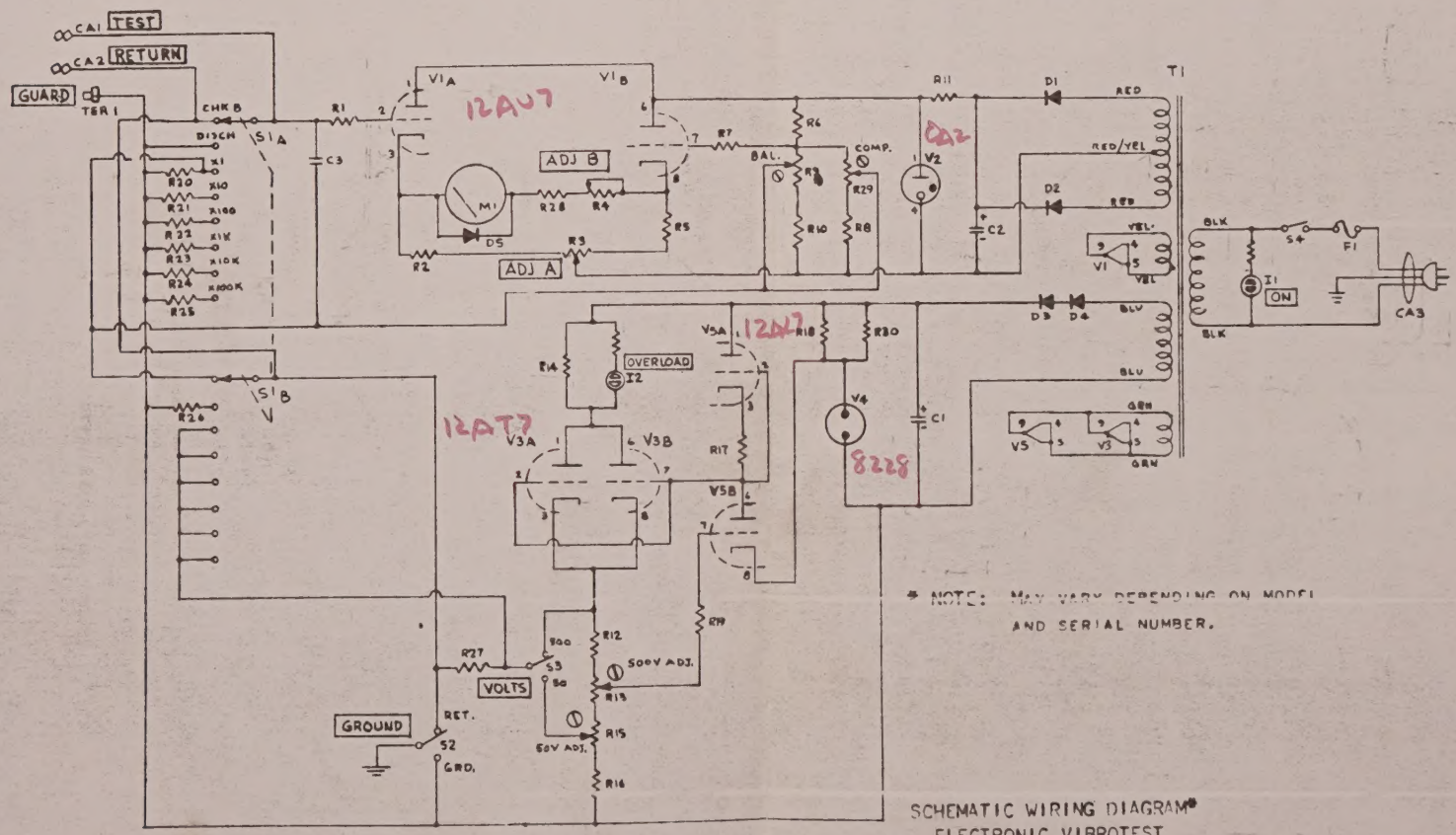
MODEL 2850 VIBROTEST - REPLACEMENT PARTS LIST*

SYMBOL	PART NO.	DESCRIPTION
C-1	P15335	Capacitor, fixed; .5 mfd @ 1 KV
C-2	P10668	Capacitor, fixed; 20 mfd @ 250 V.
C-3	P14585	Capacitor, fixed; .005 mfd @ 100 V.
CA-1	14130	Cable Assembly (TEST)
CA-2	14131	Cable Assembly (RETURN)
CA-3	P15346	Cable Assembly (LINE)
D-1, 2, 5	P14503	Diode
D-3, 4	P15322	Diode
F-1	P106	Fuse, 1.5 amp
I-1	P15327	Pilot Light, red (ON)
I-2	P15328	Pilot Light, amber (O.L.)
M-1	15345	Meter Assembly, Megohmmeter
R-1	P14315	Resistor, fixed; 1 meg, 1/2 watt, ± 10%
R-2,5	P14791	Resistor, fixed; 100K ohms, 1/2 watt, ± 5%
R-3	P13031	Resistor, variable; 10K ohms, 2 watt (ADJ. A)
R-4	P10854	Resistor, variable; 3K ohms, 2 watt (ADJ. B)
R-6	P14216	Resistor, fixed; 33K ohms, 1/2 watt, ± 10%
R-7, 8, 16	P14790	Resistor, fixed; 22K ohms, 1/2 watt, ± 5%
R-9	P14723	Resistor, variable; 1K ohms, 2 watt "BAL."
R-10	P10728	Resistor, fixed; 56K ohms, 1/2 watt, ± 5%
R-11	P15337	Resistor, fixed; 1K ohms, 1 watt, ± 10%
R-12	P10105	Resistor, fixed; 270K ohms, 1 watt, ± 10%
R-13,29	P14743	Resistor, variable, 10K ohms, 2 watt "COMP" "500 ADJ."
R-14	P9428	Resistor, fixed; 10K ohms, 2 watt, ± 10%
R-15	P14009	Resistor, variable; 25K ohms "50 ADJ."
R-17	P7031	Resistor, fixed; 100K ohms, 1/2 watt, ± 10%
R-18, 30	P10196	Resistor, fixed; 680K ohms, 2 watt, ± 10%
R-19	P10729	Resistor, fixed; 1.8 megohms, 1/2 watt, ± 5%
R-20	**NSN	Resistor, fixed; 4K ohms, 10 watt, ± 1%
R-21	P10734	Resistor, fixed; 40K ohms, 1/2 watt, ± 1%
R-22	P11822	Resistor, fixed; 400K ohms, 1/2 watt, ± 1%
R-23	P11824	Resistor, fixed; 4 megohms, 1/2 watt, ± 1%
R-24	P15343	Resistor, fixed; 40 megohms, 1/2 watt, ± 1%
R-25	P15338	Resistor, fixed; 400 megohms, 1/2 watt, ± 1%
R-26	**NSN	Resistor, fixed; 10K ohms, 10 watt, ± 5%
R-27	P10735	Resistor, fixed; 1 megohm, 1/2 watt, ± 1%
R-28	P8333	Resistor, fixed; 4.7K ohms, 1/2 watt, ± 10%
S-1	P15410	Switch, rotary, range switch
S-2, 3	P15334	Switch, toggle, SPDT (GROUND & VOLTS)
S-4	P8951	Switch, SPDT
T-1	P15320	Transformer, power
TER-1	P11817	Terminal, black (GUARD)
V-1	P15349	Tube, vacuum, 12AU7A, Mullard 10M series
V-2	P8945	Tube, 0A2
V-3	P8953	Tube, vacuum, 12AT7
V-4	P15319	Tube, 8228
V-5	P15133	Tube, vacuum, 12AX7

* Certain parts may vary with serial number . When ordering, please specify model and serial number along with complete description.

**NSN - Denotes no stock number.


Bal.
R9
V1
12AV7
V2
0A2
C.D.P.
V5
12AX7
V3
12AT7
V4
8228
R15
"50" Adj.
R13
"500" Adj.



* NOTE: MAY VARY DEPENDING ON MODEL AND SERIAL NUMBER.

SCHEMATIC WIRING DIAGRAM*
ELECTRONIC VIBROTEST

FIG. 6

FACTORY WARRANTY

VIBROTESTS are guaranteed free from defects in workmanship and material for one year from date of shipment provided Owner's Registration Card is returned within fifteen days from receipt of unit and there is no evidence of tampering or abuse.

This Warranty does not cover tubes, batteries or accessories not of our manufacture.

Any unit found defective under this guarantee will be repaired or replaced free of charge if returned to the factory PREPAID and insured.

ASSOCIATED RESEARCH, INC.
3758 W. Belmont Avenue, Chicago 18, Illinois

Printed in U.S.A.

ELECTRICAL TESTING INSTRUMENTS SINCE 1936

- **VIBROTEST®**
  Megohmmeters Measure Insulation Resistance
- **HYPOT®**
  A-C and D-C High Voltage Test Sets
- **VIBROGROUND®**
  Resistance Measurement of Electrical Grounds, Earth Conductivity and Resistance
- **PHASE SEQUENCE Indicator**
- **"THUMPER" Cable Fault Locator**
- **"DONUT" Instrument Current Transformers**

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High voltage breakdown and dielectric strength testing of insulating materials in electrical equipment . . . at time of installation and as a periodic maintenance procedure, are provided by the complete line of HYPOT® Test Sets. Application bulletin "Practical HYPOT® Testing" will be sent on

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